Noise Break-in Assessment

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69-71 High Street West, Glossop

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1. Summary

1.1. Proposal

A development of residential dwellings is proposed at 69-71 High Street West, Glossop.

1.2. Reason for Assessment

The proposed dwellings are adjoined to an existing Public House. A sound insulation assessment is required in order to determine the level of noise break-in from the pub to the residential dwellings and provide mitigation in terms of sound insulation, if necessary. The local planning authority has raised concerns of internal noise levels within the first-floor level function room, in which live bands sometimes perform.

1.3. Planning Conditions & Criteria

For desirable internal noise levels to be maintained due to noise transfer from the public house, given in BS8233:2014 as:

- 30 dB L_{Aeq} in bedrooms (23:00 – 07:00)

For noise levels not to exceed NR25 within the residential dwellings during live performances within the function room of the public house.

1.4. Assessment Standards & Justification

'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' is a recognised standard for assessing and mitigating environmental noise levels upon a proposed noise sensitive development.

'Noise Rating Curve – ISO 1973' give graphs of acceptable sound pressure levels plotted against frequency and are determined based on hearing preservation, speech and annoyance. Referencing noise break-in to NR curves allows for a more comprehensive assessment of internal noise levels due to the frequency dependency of the acceptable noise levels, as opposed to a single, broadband target.

1.5. Measurements

To assess noise transfer, the first-floor level function room of the public house was excited to >100dB L_{eq}. Ambient and residual noise measurements were taken within the proposed residential dwellings to determine the insertion loss between the function room and residential dwellings.

1.6. Noise Assessment Outcome

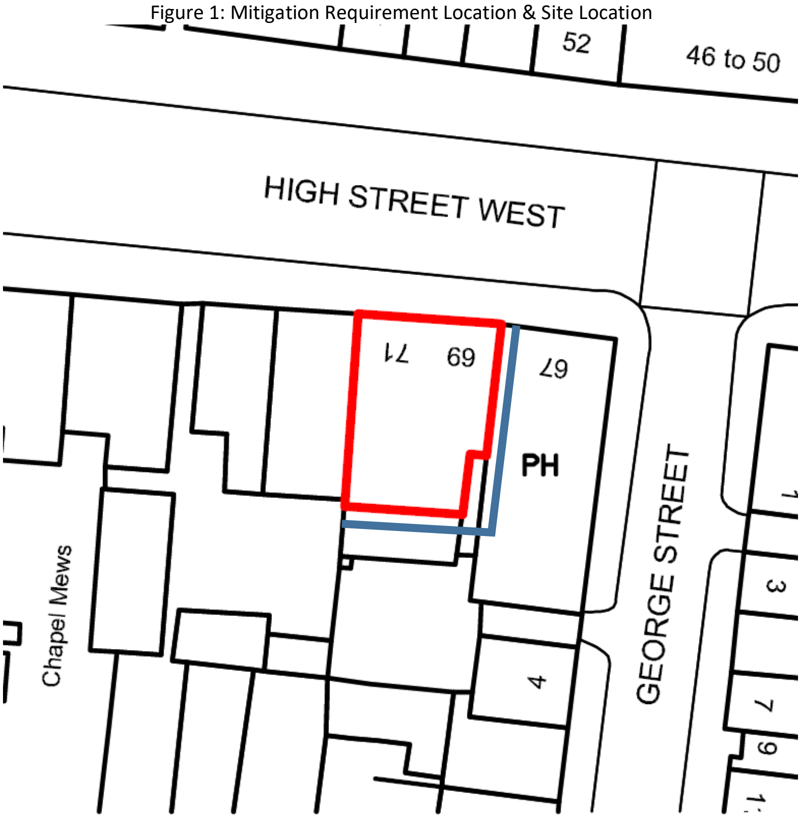
It was determined that the chief cause of noise transfer was from secondary transmission through glazed areas of the façade. Noise transfer through structural components, i.e. walls was noted as being minimal. The criteria is exceeded, therefore, mitigation has been specified.

1.7. Mitigation Recommendations

It is recommended that all living room and bedroom windows on the southern and eastern façade achieve a sound insulation value of **≥39 dB R_{W+Ctr}**, which can be achieved through secondary glazing and/or specialist double glazing. The sound insulation value must consider both the glass and frame sound insulation. Example systems to achieve the required sound insulation are shown below:

- Secondary glazing: 6mm pane → 150mm cavity → 4mm pane.
- Double glazing: 10mm pane → 16mm argon filled cavity → 9.1mm Pilkington Optiphon™ pane.

Figure 1: Mitigation Requirement Location & Site Location



Glazing enhancement required

Site location

2. Noise Break-in Assessment

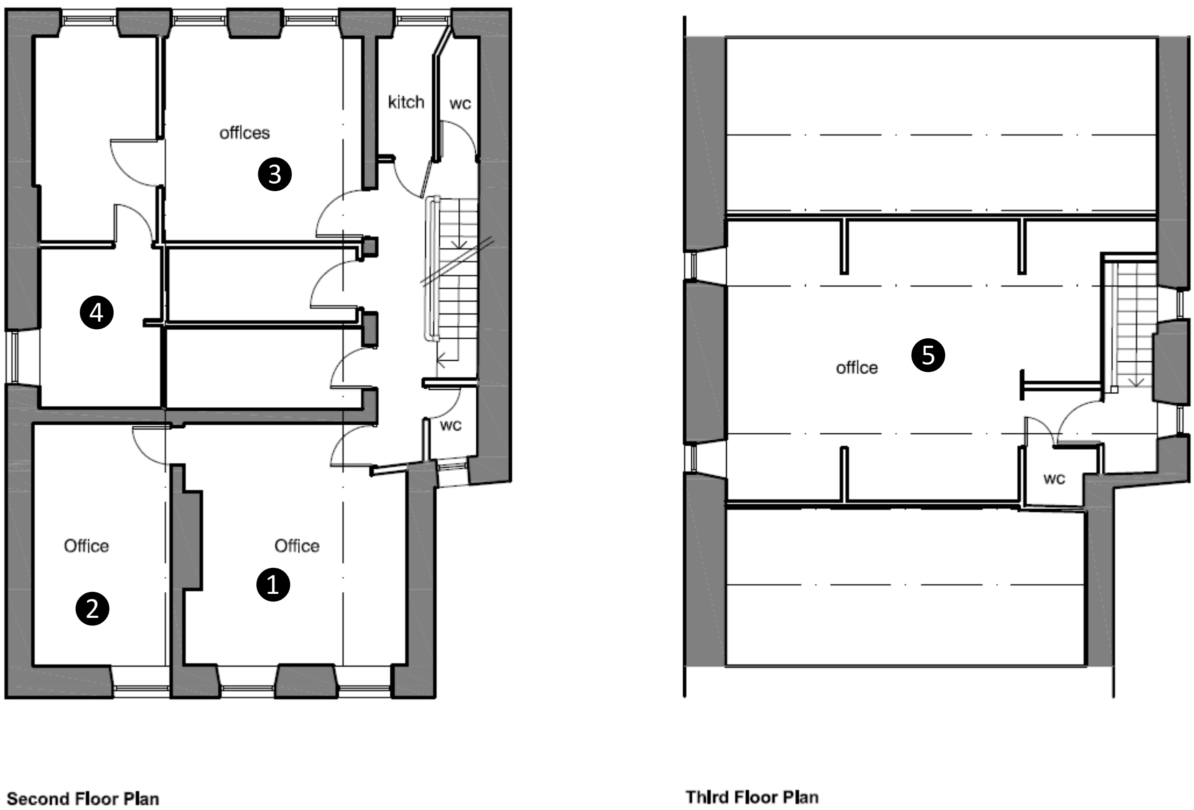
2.1. Source Under Investigation

The primary source of noise break-in will arise from live bands performing within the FF level function roof associated with the adjacent pubic house, 'The Oakwood'. Noise levels of a live band performing within a small live music venue previously measured by Peak Acoustics as **98.6dB $L_{Aeq,30mins}$ / 109.1dB $L_{Zeq,30mins}$** have been utilised for the assessment of noise transfer.

3. Survey Procedure

- Measurements were obtained in 8s periods in 1/3 octave bands. Measurements were taken at various locations throughout the rooms.
- The function room was excited to 113.0dB $L_{eq,8s}$. 10 measurements were obtained and an arithmetic average was determined.
- 10x no. ambient measurements (source ON) and 5x no. residual measurements (source OFF) were obtained at the following locations on site:

Figure 2: Measurement Areas



- The residual noise level is subtracted from the ambient noise level to negate extraneous noise sources, noted on site as passing road traffic.
- The difference between the source level and corrected residual noise level gives the insertion loss due to noise transfer from the function room to the proposed residential dwellings.
- The insertion loss is subtracted from the Live Band Measurement as referenced in section 2.1 to determine resultant noise-break.

Full calculations are shown in **Appendix E** and test data is shown in **Appendix F**. The measured insertion losses are tabulated below. Instances whereby the residual noise level was higher than the ambient noise level have been removed. These instances should be disregarded as the sound insulation provided between the function room and site is sufficient to mitigate noise emissions to below the current noise climate on site:

Table 1: Insertion Loss Summary

Location	63	125	250	500	1k	2k	4k	8k
❶ , dB	47.5	52.4	58.3	64.3	67.7	-	-	-
❷ , dB	-	53.5	57.8	-	61.3	-	-	-
❸ , dB	38.6	-	63.8	61.0	63.8	-	-	-
❹ , dB	-	-	-	-	-	-	-	-
❺ , dB	53.7	61.7	67.9	67.1	66.3	71.2	72.1	40.1

4. Assessment

4.1. Criteria

For desirable internal noise levels to be maintained due to noise transfer from the public house, given in BS8233:2014 as:

- 30 dB L_{Aeq} in bedrooms (23:00 – 07:00)

For noise levels to not exceed NR25 within the residential dwellings during live performances in the public house.

Results are shown in **Appendix D**. Instances whereby the assessment criteria are exceeded are highlighted in red.

4.2. Results

The criteria are exceeded; therefore, mitigation is necessary.

4.3. Subjective Impressions

It was identified by the technician on-site that the chief source of noise transfer was through the windows of both the function room and site. Minimal noise transfer was noted through structural components such as walls. It is noted that the proposed development does not directly share partition components with the function room supporting the subjective impression that structural noise transfer was minimal.

5. Mitigation

5.1. Glazing Enhancement

It is recommended that the existing 4mm single glazing of all living room and bedroom facades, as shown in figure 1, are uprated to **≥39 dB R_{W+Ctr}**. This can be achieved using systems such as those shown in section 1.7.

The improvement of uprating the existing 4mm single glazing utilising a secondary 6mm pane with 150mm cavity is shown below:

Table 2: Glazing Enhancement, 6 / 150 / 4mm

	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
4mm Single, dB R_W	10*	20	22	28	33	34	28	28*
6 / 150 / 4mm, dB R_W	14.5*	29	35	45	56	52	50	50*
Improvement, dB R_W	4.5*	9	13	17	23	18	22	22*

*63Hz sound insulation data is not given on the manufacturers specification sheet. It is assumed as half the sound insulation of the adjacent octave band. 8kHz sound insulation data is not given on the manufacturers specification sheet. It is assumed as equal to the sound insulation of the adjacent octave band.

Glazing sound insulation data is shown in **Appendix G**.

Applying the above improvement to the internal noise levels as shown in **Appendix E** demonstrates that the criteria will be met with the mitigation measures in place.

5. Uncertainty

- A representative internal live band noise source is assumed. Louder bands may perform within the function room. The noise data was obtained at a medium-sized, dedicated live music venue in a city centre and therefore the noise levels assumed in the report are deemed to be suitably stringent.
- Glazing sound insulation data did does not contain 63Hz and 8kHz sound insulation data. Reasonable assumptions have been made in order to give a more detailed assessment of frequency dependant insertion loss provided between the function room and proposed residential dwellings.
- The measurement is subject to a ±1dB error margin. Calibration was checked before and after measurements and demonstrated that the calibration drift was negligible throughout the measurement procedure.

APPENDIX A - Measurement Details

Measurements	Kit	Start Date	Start Time	End Date	End Time
M1	B1	14/06/17	10:34	14/06/17	11:03

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
B1	Sound Meter	Svantek	977	1	36815
B1	Pre-Amp	Svantek	SV12L	1	47589
B1	Calibrator	Svantek	SV33A	1	58014

APPENDIX C - Calibration Details

Measurements	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1	114.0	114.56	0.56	114.70	0.70

APPENDIX D – Results, Without Mitigation

	63	125	250	500	1k	2k	4k	8k	Sum
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
NR25	55	44	35	29	25	22	20	18	
Live Band, dB $L_{eq,30min}$	98.2	100.5	99.2	93.3	91.1	89.4	86.4	78.0	104.9
1, $L_{eq,30min}$	50.7	48.1	40.9	29.0	23.4	-	-	-	
1, Difference, NR25	-4.3	4.1	5.9	0.0	-1.6	-	-	-	
1, dB $L_{Aeq,30min}$	24.5	32.0	32.3	25.8	23.4	-	-	-	36.2
1, Difference, 30dB L_{Aeq}									6.2
2, $L_{eq,30min}$	-	47.1	41.3	-	29.8	-	-	-	
2, Difference, NR25	-	3.1	6.3	-	4.8	-	-	-	
2, dB $L_{Aeq,30min}$	-	31.0	32.7	-	29.8	-	-	-	36.1
2, Difference, 30dB L_{Aeq}									6.1
3, Internal Level, $L_{eq,30min}$	59.7	-	35.3	32.2	27.3	-	-	-	
3, Difference, NR25	4.7	-	0.3	3.2	2.3	-	-	-	
3, Internal Level, $L_{Aeq,30min}$	33.5	-	26.7	29.0	27.3	-	-	-	36.1
3, Difference, 30dB L_{Aeq}									6.1
4, Internal Level, $L_{eq,30min}$	-	-	-	-	-	-	-	-	
4, Difference, NR25	-	-	-	-	-	-	-	-	
4, dB $L_{Aeq,30min}$	-	-	-	-	-	-	-	-	
Difference, 30dB L_{Aeq}									-
5, Internal Level, dB $L_{eq,30min}$	44.5	38.8	31.2	26.2	24.8	18.2	14.2	37.9	
5, Difference, NR25	-10.5	-5.2	-3.8	-2.8	-0.2	-3.8	-5.8	19.9	
5, Internal Level, $L_{Aeq,30min}$	18.3	22.7	22.6	23.0	24.8	19.4	15.2	36.8	37.7
5, Difference, 30dB L_{Aeq}									7.7

APPENDIX E – Results, With Mitigation

Note: Improvement in 1/1 oct. shown in section 5.1, table 2.

	63	125	250	500	1k	2k	4k	8k	Sum
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
NR25	55	44	35	29	25	22	20	18	
Live Band, dB $L_{eq,30min}$	98.2	100.5	99.2	93.3	91.1	89.4	86.4	78.0	104.9
1, $L_{eq,30min}$	36.2	19.1	5.9	-16.0	-32.6	-	-	-	
1, Difference, NR25	-18.8	-24.9	-29.1	-45.0	-57.6	-	-	-	
1, dB $L_{Aeq,30min}$	10.0	3.0	-2.7	-19.2	-32.6	-	-	-	11.0
1, Difference, 30dB L_{Aeq}									-19.0
2, $L_{eq,30min}$	-	38.1	28.3	-	6.8	-	-	-	
2, Difference, NR25	-	-5.9	-6.7	-	-18.2	-	-	-	
2, dB $L_{Aeq,30min}$	-	22.0	19.7	-	6.8	-	-	-	24.1
2, Difference, 30dB L_{Aeq}									-5.9
3, Internal Level, $L_{eq,30min}$	55.2	-	22.3	15.2	4.3	-	-	-	
3, Difference, NR25	0.2	-	-12.7	-13.8	-20.7	-	-	-	
3, Internal Level, $L_{Aeq,30min}$	29.0	-	13.7	12.0	4.3	-	-	-	29.2
3, Difference, 30dB L_{Aeq}									-0.8
4, Internal Level, $L_{eq,30min}$	-	-	-	-	-	-	-	-	
4, Difference, NR25	-	-	-	-	-	-	-	-	
4, dB $L_{Aeq,30min}$	-	-	-	-	-	-	-	-	
Difference, 30dB L_{Aeq}									-
5, Internal Level, dB $L_{eq,30min}$	40.0	29.8	18.2	9.2	1.8	0.2	-7.8	15.9	
5, Difference, NR25	-15.0	-14.2	-16.8	-19.8	-23.2	-21.8	-27.8	-2.1	
5, Internal Level, $L_{Aeq,30min}$	13.8	13.7	9.6	6.0	1.8	1.4	-6.8	14.8	19.7
5, Difference, 30dB L_{Aeq}									-10.3

APPENDIX F – Test Data

❶	1/1 Oct.	63	125	250	500	1k	2k	4k	8k	Sum
	Source	98.2	109.7	107.5	102.1	99.1	100.9	99.2	63.0	113.0
	Ambient	52.8	57.6	50.1	42.7	38.7	35.8	34.8	28.2	59.6
	Residual	48.6	46.3	43.0	41.0	37.8	36.7	34.9	31.5	52.1
	Corrected	50.7	57.3	49.2	37.8	31.4	-	-	-	-
	Insertion Loss	47.5	52.4	58.3	64.3	67.7	-	-	-	-
❷	1/1 Oct.	63	125	250	500	1k	2k	4k	8k	Sum
	Source	98.2	109.7	107.5	102.1	99.1	100.9	99.2	63.0	113.0
	Ambient	48.2	56.7	50.5	40.4	40.8	34.0	31.9	27.3	58.3
	Residual	48.6	46.3	43.0	41.0	37.8	36.7	34.9	31.5	52.1
	Corrected	-	56.2	49.6	-	37.8	-	-	-	-
	Insertion Loss	-	53.5	57.8	-	61.3	-	-	-	-
❸	1/1 Oct.	63	125	250	500	1k	2k	4k	8k	Sum
	Source	98.2	109.7	107.5	102.1	99.1	100.9	99.2	63.0	113.0
	Ambient	63.5	49.3	47.9	44.6	41.6	37.0	32.4	28.1	63.9
	Residual	61.2	49.5	45.9	42.0	40.4	38.4	33.9	29.5	61.7
	Corrected	59.7	-	43.6	41.1	35.3	-	-	-	-
	Insertion Loss	38.6	-	63.8	61.0	63.8	-	-	-	-

❹	1/1 Oct.	63	125	250	500	1k	2k	4k	8k	Sum
	Source	98.2	109.7	107.5	102.1	99.1	100.9	99.2	63.0	113.0
	Ambient	47.5	42.7	37.6	32.5	29.9	28.0	26.4	27.1	49.3
	Residual	56.5	53.7	42.8	38.3	33.3	34.0	32.7	29.9	58.5
	Corrected	-	-	-	-	-	-	-	-	-
	Insertion Loss	-	-	-	-	-	-	-	-	-
❺	1/1 Oct.	63	125	250	500	1k	2k	4k	8k	Sum
	Source	98.2	109.7	107.5	102.1	99.1	100.9	99.2	63.0	113.0
	Ambient	49.5	49.3	42.0	37.2	35.2	32.7	30.3	28.7	53.1
	Residual	47.9	43.5	38.3	33.0	31.5	29.7	27.5	27.3	49.9
	Corrected	44.5	48.0	39.5	35.1	32.8	29.7	27.0	23.0	50.3
	Insertion Loss	53.7	61.7	67.9	67.1	66.3	71.2	72.1	40.1	76.7

Note: 1/3 oct. data converted to 1/1 oct. for ease of reporting

APPENDIX G – Glazing Sound Insulation Data

Table 1 – Single Glazing

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)									
	4		6		10		19		6.4 PVB	
100	17		18		24		25		18	
125	23	20	22	20	26	26	29	28	22	20
160	22		22		28		31		22	
200	21		22		26		31		22	
250	21	22	26	24	28	27	32	32	26	24
315	24		26		29		35		26	
400	26		29		32		36		29	
500	29	28	31	31	34	34	38	37	31	31
630	30		33		36		36		33	
800	32		34		37		35		34	
1000	34	33	36	35	36	35	38	37	36	35
1250	34		36		33		40		36	
1600	36		32		33		44		36	
2000	36	34	26	29	38	36	47	46	34	33
2500	31		30		41		50		31	
3150	25		34		43		52		35	
4000	31	28	37	36	44	44	55	54	39	38
R_m (dB)	27		29		33		37		30	
R_w (dB)	30		32		36		40		33	
R_{TRA} (dBA)	27		28		32		35		29	

Table 3 – Double Windows (Secondary Sashes)

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)					
	6/100/4		6/150/4		10/200/6	
100	25		27		32	
125	27	26	30	29	37	35
160	27		30		39	
200	33		34		45	
250	33	34	34	35	46	46
315	37		39		46	
400	41		42		47	
500	46	44	46	45	45	46
630	50		50		45	
800	54		54		44	
1000	57	56	57	56	45	46
1250	59		58		50	
1600	58		58		53	
2000	52	53	52	52	58	56
2500	51		49		58	
3150	48		47		64	
4000	57	52	52	50	64	65
R_m (dB)	44		44		47	
R_w (dB)	46		47		49	
R_{TRA} (dBA)	37		39		45	

Source: Glass and Noise Control, Technical Bulletin, Pilkington

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington **Optiphon™**	26	27	31	36	40	39	36 (-1; -4)	36	35	32
8.8 mm Pilkington **Optiphon™**	24	28	34	38	37	43	37 (-1; -4)	37	36	33
9.1 mm Pilkington **Optiphon™**	26	29	34	38	38	43	37 (-1; -3)	37	36	34
12.8 mm Pilkington **Optiphon™**	30	32	37	39	41	51	39 (0; -2)	39	39	37
13.1 mm Pilkington **Optiphon™**	30	33	37	40	41	50	40 (0; -2)	40	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington **Optiphon™**	22	27	35	42	41	48	38 (-2; -5)	38	36	33
6 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	24	26	40	48	46	54	41 (-3; -7)	41	38	34
8 mm / 16 mm argon / 9.1 mm Pilkington **Optiphon™**	24	29	41	47	47	55	43 (-3; -7)	43	40	36
10 mm / 16 mm argon / 9.1 mm Pilkington **Optiphon™**	29	33	44	46	49	57	45 (-2; -5)	45	43	40
8.8 mm Pilkington **Optiphon™** / 16 mm argon / 12.8 mm Pilkington **Optiphon™**	26	36	46	50	52	63	47 (-2; -7)	47	45	40
9.1 mm Pilkington **Optiphon™** / 20 mm argon / 13.1 mm Pilkington **Optiphon™**	29	39	49	52	55	63	50 (-3; -8)	50	47	42

Measurements undertaken in accordance with BS EN ISO 10140 and R_w (C; C_{tr}) determined in accordance with BS EN ISO 717-1
For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm
Pendulum body impact resistance to BS EN 12600 for all Pilkington **Optiphon™** is Class 1 (B) 1
To achieve low U values in insulating glass units, Pilkington **Optiphon™** can be combined with low emissivity glass from the Pilkington **K Glass™** or Pilkington **Optitherm™** ranges
To calculate performance data for Pilkington products, please use our Spectrum online calculator at www.pilkington.co.uk/spectrum
For glass combinations to achieve an R_w value higher than 50 dB, please contact us for more details

Source: Pilkington Optiphon™ , Laminated Glass for noise control